The Brief Evaluation of Receptive Aphasia (BERA) test for the detection of language impairment in severely brain-injured patients

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Background

One of the most common questions regarding post-comatose patients with disorders of consciousness (DoC) is “Can they understand us?”

This is even more important as language disorders represent major issues for the assessment of consciousness in patients in a minimally conscious state (MCS) or emerging from the MCS (EMCS). Receptive aphasia might prevent consistent responses to verbal items, leading to an underestimation of consciousness in aphasic patients.

Here we aim to develop a new behavioral tool to assess residual language abilities in DoC patients, as it was suggested by previous studies.

Methods

The Brief Evaluation of Receptive Aphasia (BERA) assesses 3 specific language levels (phonology, semantic, morphosyntax) in MCS patients or EMCS patients, as soon as they are able to visually fixate a target image that is presented next to a distractor.

1) Multiple assessments in aphasic conscious patients

2) Multimodal assessment of MCS and EMCS patients

Results

1) Multiple assessments in aphasic conscious patients

Content validity

<table>
<thead>
<tr>
<th>V1</th>
<th>V2</th>
<th>V3</th>
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</thead>
<tbody>
<tr>
<td>V2</td>
<td>r = 0.858*</td>
<td>/</td>
</tr>
<tr>
<td>V3</td>
<td>r = 0.945*</td>
<td>r = 0.833*</td>
</tr>
<tr>
<td>V4</td>
<td>r = 0.677*</td>
<td>r = 0.935*</td>
</tr>
<tr>
<td></td>
<td>p = 0.001</td>
<td>p = 0.020</td>
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<tr>
<td></td>
<td>p = 0.045</td>
<td>p = 0.001</td>
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</tbody>
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Inter-rater reliability

α = 0.919*

Concurrent validity

Intra-rater reliability

Test-retest

BERA 1

r = 0.586*

r = 0.826*

LAST (comprehension)

BERA 2

2) Multimodal assessment of MCS and EMCS patients

Patients 1 and 2: MCS+

Patient 1: BERA: 21/30

Phonology: 8/10

Semantic: 6/10

Morphosyntax: 5/10

CRS-R: 11/23

Patient 2: BERA: 22/30

Phonology: 7/10

Semantic: 8/10

Morphosyntax: 7/10

CRS-R: 23/23

Patients 3 and 4: EMCS

Patient 3: BERA: 16/30

Phonology: 8/10

Semantic: 6/10

Morphosyntax: 2/10

CRS-R: 15/23

Patient 4: BERA: 16/30

Phonology: 7/10

Semantic: 6/10

Morphosyntax: 3/10

CRS-R: 9/23

DoC patients’ phonological sub-scores are similar to those of aphasic patients

Semantic and morphosyntactic sub-scores are significantly lower than those of aphasic patients

Lower BERA scores are observed in patients with glucose hypometabolism in language brain areas

Conclusions

The BERA shows good psychometric properties in aphasic conscious patients.

BERA assessment has been shown to be feasible and efficient in DoC patients, and complements already existing behavioral assessments.

BERA indicates language domains that are particularly poorly functioning in DoC patients, and which could be specifically targeted by rehabilitation.

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